Claims

1. A method for processing a sequence of video frames, said method comprising:

dynamically encoding said sequence of video frames to produce a pseudo-constant bits per frame compressed signal at a scene change within said sequence of video frames, said dynamically encoding comprising:

detecting when a new scene occurs in the sequence of video frames; and

responsive to said detecting, dynamically determining a group of frequency domain pixel data to be retained for a frame of the new scene.

2. The method of claim 1, wherein said dynamically determining comprises determining a level of frequency domain pixel data to be retained from multiple predefined levels, and wherein said determining determines the level of frequency domain pixel data to be retained for an initial frame of the new scene.

3. The method of claim 2, wherein said level of frequency data to be retained is associated with a frequency constraining pattern, and said determining comprises selecting a frequency constraining pattern to be employed from a plurality of frequency constraining patterns associated with said multiple predefined levels.

4. The method of claim 3, wherein said plurality of frequency patterns comprise a common geometrical shape, and wherein said common geometrical shape of said plurality of frequency patterns can be one of a plurality of common geometrical shapes.

5. The method of claim 3, wherein at least one most significant frequency pixel is included by each of the plurality of frequency constraining patterns.

6. The method of claim 1, wherein said dynamically determining comprises determining said group of frequency domain pixel data to be retained for said frame of the new scene by evaluating picture difficulty of the new scene.

7. The method of claim 6, wherein said dynamically determining further comprises ascertaining picture difficulty indicators representative of picture difficulty of the new scene, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in at least some of horizontal, vertical, and diagonal directions.

8. The method of claim 7, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in each of said horizontal, vertical, and diagonal directions.

9. The method of claim 7, wherein said ascertaining comprises determining a maximum indicator for a frame picture of a progressive video source or a field picture of an interlaced video source, said maximum indicator being determined by comparing said picture difficulty indicators to each other.

10. The method of claim 7, wherein said ascertaining comprises ascertaining picture difficulty indicators in vertical and diagonal directions for both top and bottom fields of a frame of an interlaced video source, and picture difficulty indicators in vertical and diagonal directions for the frame of the interlaced video source, and wherein said ascertaining further comprises ascertaining field-based indicators in vertical and diagonal directions by computing a weighted summation of individual top and bottom field indicators having a same direction, and wherein for each vertical and diagonal direction, a picture difficulty indicator is determined by ascertaining a minium number between a corresponding field-based indicator and a frame-based indicator derived from the same frame of the interlaced video source.

11. The method of claim 10, wherein said ascertaining comprises selecting said picture difficulty indicators by determining a maximum indicator of the ascertained vertical and diagonal indicators, as well as a horizontal indicator.

12. The method of claim 9, wherein said ascertaining further comprises mapping the maximum indicator to a level of an n-level quantizer if the value of the maximum indicator is between predefined thresholds, and mapping the maximum indicator to a constant number if the indicator is outside of said predefined thresholds.

13. The method of claim 12, further comprising employing said mapping to identify an address of a frequency pattern in a look-up table, said look-up table containing a plurality of frequency patterns, and wherein said determining comprises selecting one frequency pattern of said plurality of frequency patterns.

14 The method of claim 13, wherein when the maximum indicator has a large nominal value it is re-mapped into a frequency pattern comprising a lesser number of frequency coefficients than a number of coefficients of a frequency pattern corresponding to when the maximum indicator has a smaller nominal value.

15. The method of claim 14, wherein said plurality of frequency patterns are indexed such that a population of one frequency pattern is a subset of a population of a frequency pattern with a lower index number.

16. The method of claim 14, wherein said determining comprises comparing each frequency coefficient of a block with respect to said selected frequency pattern, and if the coefficient belongs to the frequency pattern, the coefficient is retained as part of said group of frequency domain pixel data.

17. The method of claim 1, wherein after a final frame count, if the actual frame bits is smaller than the difference of a predefined number and a guard band value, the difference is computed and a number of zero bytes according to this difference is added to the final picture count to ensure said pseudo-constant bits per frame compressed signal.

18. The method of claim 1, wherein said method is implemented within an MPEG encoder.

19. The method of claim 1, wherein said dynamically encoding further comprises encoding said frame of the new scene as a intra-coded frame.

20. A method for processing a sequence of video frames, said method comprising:

dynamically encoding said sequence of video frames, said dynamically encoding comprising:

encoding multiple blocks of a first frame of the sequence of video frames in intra-coded mode using a first orientation for said intra-coded blocks; and

encoding multiple blocks of a second frame of the sequence of video frames in intra-coded mode using a second orientation for said intra-coded blocks, wherein said first orientation and said second orientation are perpendicular.

21. The method of claim 20, wherein said first orientation comprises a first diagonal orientation, and said second orientation comprises a second diagonal orientation.

22. The method of claim 21, wherein said first frame and said second frame comprise adjacent frames in said sequence of video frames.

23. The method of claim 21, wherein said multiple intra-coded blocks of said first frame are scattered throughout said first frame, and wherein said multiple intra-coded blocks of said second frame are scattered throughout said second frame.

24. The method of claim 21, wherein said multiple intra-coded blocks of said first frame are equally spaced along a direction perpendicular to said first orientation of said multiple intra-coded blocks, and wherein said multiple intra-coded blocks of said second frame are equally spaced along a direction perpendicular to said second orientation of the multiple intra-coded blocks.

25. The method of claim 21, wherein said encoding said multiple blocks of said first frame in intra-coded mode using said first orientation comprises imposing different sub-sampling rates on said multiple intra-coded blocks along said first orientation, and wherein said encoding multiple blocks of said second frame in intra-coded mode using said second orientation comprises imposing different sub-sampling rates on said multiple intra-coded blocks along said second orientation.

26. The method of claim 21, wherein said sequence of video frames comprises a plurality of even numbered frames and a plurality of odd numbered frames, and wherein said first frame comprises one frame of said plurality of even numbered frames and said second frame comprises one frame of said plurality of odd numbered frames, and wherein intra-coded blocks of said plurality of even numbered frames move along said first orientation in a direction opposite from that of intra-coded blocks moving along said second orientation within said plurality of odd numbered frames.

27. A system for processing a sequence of video frames, said system comprising:

an encoder for dynamically encoding said sequence of video frames to produce a pseudo-constant bits per frame compressed signal at a scene change within said sequence of video frames, said encoder comprising:

means for detecting when a new scene occurs in the sequence of video frames; and

means for dynamically determining a group of frequency domain pixel data to be retained for a frame of the new scene responsive to said detecting of the new scene.

28. The system of claim 27, wherein said means for dynamically determining comprises means for determining a level of frequency domain pixel data to be retained from multiple predefined levels, and wherein said means for determining determines the level of frequency domain pixel data to be retained for an initial frame of the new scene.

29. The system of claim 28, wherein said level of frequency data to be retained is associated with a frequency constraining pattern, and said means for determining comprises means for selecting a frequency constraining pattern to be employed from a plurality of frequency constraining patterns associated with said multiple predefined levels.

30. The system of claim 29, wherein said plurality of frequency patterns comprise a common geometrical shape, and wherein said common geometrical shape of said plurality of frequency patterns can be one of a plurality of common geometrical shapes.

31. The system of claim 29, wherein at least one most significant frequency pixel is included by each of the plurality of frequency constraining patterns.

32. The system of claim 27, wherein said means for dynamically determining comprises means for determining said group of frequency domain pixel data to be retained for said frame of the new scene by evaluating picture difficulty of the new scene.

33. The system of claim 32, wherein said means for dynamically determining further comprises means for ascertaining picture difficulty indicators representative of picture difficulty of the new scene, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in at least some of horizontal, vertical, and diagonal directions.

34. The system of claim 33, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in each of said horizontal, vertical, and diagonal directions.

35. The system of claim 33, wherein said means for ascertaining comprises means for determining a maximum indicator for a frame picture of a progressive video source or a field picture of an interlaced video source, said maximum indicator being determined by comparing said picture difficulty indicators to each other.

36. The system of claim 33, wherein said means for ascertaining comprises means for ascertaining picture difficulty indicators in vertical and diagonal directions for both top and bottom fields of a frame of an interlaced video source, and picture difficulty indicators in vertical and diagonal directions for the frame of the interlaced video source, and wherein said means for ascertaining further comprises means for ascertaining field-based indicators in vertical and diagonal directions by computing a weighted summation of individual top and bottom field indicators having a same direction, and wherein for each vertical and diagonal direction, a picture difficulty indicator is determined by ascertaining a minium number between a corresponding field-based indicator and a frame-based indicator derived from the same frame of the interlaced video source.

37. The system of claim 36, wherein said means for ascertaining comprises means for selecting said picture difficulty indicators by determining a maximum indicator of the ascertained vertical and diagonal indicators, as well as a horizontal indicator.

38. The system of claim 35, wherein said means for ascertaining further comprises means for mapping the maximum indicator to a level of an n-level quantizer if the value of the maximum indicator is between predefined thresholds, and for mapping the maximum indicator to a constant number if the indicator is outside of said predefined thresholds.

39. The system of claim 38, further comprising means for employing said mapping to identify an address of a frequency pattern in a look-up table, said look-up table containing a plurality of frequency patterns, and wherein said means for determining comprises means for selecting one frequency pattern of said plurality of frequency patterns.

40. The system of claim 39, wherein when the maximum indicator has a large nominal value it is re-mapped into a frequency pattern comprising a lesser number of frequency coefficients than a number of coefficients of a frequency pattern corresponding to when the maximum indicator has a smaller nominal value.

41. The system of claim 40, wherein said plurality of frequency patterns are indexed such that a population of one frequency pattern is a subset of a population of a frequency pattern with a lower index number.

42. The system of claim 40, wherein said means for determining comprises means for comparing each frequency coefficient of a block with respect to said selected frequency pattern, and if the coefficient belongs to the frequency pattern, the coefficient is retained as part of said group of frequency domain pixel data.

43. The system of claim 27, wherein after a final frame count, if the actual frame bits is smaller than a difference of a predefined number and a guard band value, said system further comprises means for computing the difference and adding a number of zero bytes according to this difference to the final picture count to ensure said pseudo-constant bits per frame compressed signal.

44. The system of claim 27, wherein said encoder comprises an MPEG encoder.

45. The system of claim 27, wherein said means for dynamically encoding further comprises means for encoding said frame of the new scene as a intra-coded frame.

46. A system for processing a sequence of video frames, said system comprising:

an encoder for dynamically encoding said sequence of video frames, said encoder comprising:

means for encoding multiple blocks of a first frame of the sequence of video frames in an intra-coded mode using a first orientation for said intra-coded blocks; and

means for encoding multiple blocks of a second frame of the sequence of video frames in intra-coded mode using a second orientation for said intra-coded blocks, wherein said first orientation and said second orientation are perpendicular.

47. The system of claim 46, wherein said first orientation comprises a first diagonal orientation, and said second orientation comprises a second diagonal orientation.

48. The system of claim 47, wherein said first frame and said second frame comprise adjacent frames in said sequence of video frames.

49. The system of claim 47, wherein said multiple intra-coded blocks of said first frame are scattered throughout said first frame, and wherein said multiple intra-coded blocks of said second frame are scattered throughout said second frame.

50. The system of claim 47, wherein said multiple intra-coded blocks of said first frame are equally spaced along a direction perpendicular to said first orientation of said multiple intra-coded blocks, and wherein said multiple intra-coded blocks of said second frame are equally spaced along a direction perpendicular to said second orientation of the multiple intra-coded blocks.

51. The system of claim 47, wherein said means for encoding said multiple blocks of said first frame in intra-coded mode using said first orientation comprises means for imposing different sub-sampling rates on said multiple intra-coded blocks along said first orientation, and wherein said means for encoding multiple blocks of said second frame in intra-coded mode using said second orientation comprises means for imposing different sub-sampling rates on said multiple intra-coded blocks along said second orientation.

52. The system of claim 47, wherein said sequence of video frames comprises a plurality of even numbered frames and a plurality of odd numbered frames, and wherein said first frame comprises one frame of said plurality of even numbered frames and said second frame comprises one frame of said plurality of odd numbered frames, wherein intra-coded blocks of said even numbered frames move along said first orientation in a direction opposite from that of intra-coded blocks moving along said second orientation within said plurality of odd numbered frames.

53. A system for processing a sequence of video frames, said system comprising:

an encoder for dynamically encoding said sequence of video frames to produce a pseudo-constant bits per frame compressed signal at a scene change within said sequence of video frames, said encoder comprising a frequency domain data management unit, said frequency domain data management unit comprising:

a scene-change detector for detecting when a new scene occurs in the sequence of video frames;

a picture difficulty evaluator for evaluating picture difficulty of the new scene;

a frequency classifier and constrainer for dynamically determining a group of frequency domain pixel data to be retained for a frame of the new scene responsive to said detecting of the new scene and complexity of the picture as determined by said picture difficulty evaluator.

54. A system for processing a sequence of video frames, said system comprising:

an encoder for dynamically encoding said sequence of video frames, said encoder comprising:

an intra-updater unit for assigning which blocks of a plurality of blocks of a frame are to be intra-coded, wherein said intra-updater unit facilitates:

encoding multiple blocks of a first frame of the sequence of video frames in an intra-coded mode using a first orientation for said intra-coded blocks; and

encoding multiple blocks of a second frame of the sequence of video frames in intra-coded mode using a second orientation for said intra-coded blocks, wherein said first orientation and said second orientation are perpendicular.

55. At least one program storage device readable by a machine, tangibly embodying at least one program of instructions executable by the machine to perform a method for processing a sequence of video frames, said method comprising:

dynamically encoding said sequence of video frames to produce a pseudo-constant bits per frame compressed signal at a scene change within said sequence of video frames, said dynamically encoding comprising:

detecting when a new scene occurs in the sequence of video frames; and

responsive to said detecting, dynamically determining a group of frequency domain pixel data to be retained for a frame of the new scene.

56. The at least one program storage device of claim 55, wherein said dynamically determining comprises determining a level of frequency domain pixel data to be retained from multiple predefined levels, and wherein said determining determines the level of frequency domain pixel data to be retained for an initial frame of the new scene.

57. The at least one program storage device of claim 56, wherein said level of frequency data to be retained is associated with a frequency constraining pattern, and said determining comprises selecting a frequency constraining pattern to be employed from a plurality of frequency constraining patterns associated with said multiple predefined levels.

58. The at least one program storage device of claim 57, wherein said plurality of frequency patterns comprise a common geometrical shape, and wherein said common geometrical shape of said plurality of frequency patterns can be one of a plurality of common geometrical shapes.

59. The at least one program storage device of claim 57, wherein at least one most significant frequency pixel is included by each of the plurality of frequency constraining patterns.

60. The at least one program storage device of claim 55, wherein said dynamically determining comprises determining said group of frequency domain pixel data to be retained for said frame of the new scene by evaluating picture difficulty of the new scene.

61. The at least one program storage device of claim 60, wherein said dynamically determining further comprises ascertaining picture difficulty indicators representative of picture difficulty of the new scene, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in at least some of horizontal, vertical, and diagonal directions.

62. The at least one program storage device of claim 61, wherein said picture difficulty indicators are ascertained by computing pixel-to-pixel differences in each of said horizontal, vertical, and diagonal directions.

63. The at least one program storage device of claim 61, wherein said ascertaining comprises determining a maximum indicator for a frame picture of a progressive video source or a field picture of an interlaced video source, said maximum indicator being determined by comparing said picture difficulty indicators to each other.

64. The at least one program storage device of claim 61, wherein said ascertaining comprises ascertaining picture difficulty indicators in vertical and diagonal directions for both top and bottom fields of a frame of an interlaced video source, and picture difficulty indicators in vertical and diagonal directions for the frame of the interlaced video source, and wherein said ascertaining further comprises ascertaining field-based indicators in vertical and diagonal directions by computing a weighted summation of individual top and bottom field indicators having a same direction, and wherein for each vertical and diagonal direction, a picture difficulty indicator is determined by ascertaining a minium number between a corresponding field-based indicator and a frame-based indicator derived from the same frame of the interlaced video source.

65. The at least one program storage device of claim 64, wherein said ascertaining comprises selecting said picture difficulty indicators by determining a maximum indicator of the ascertained vertical and diagonal indicators, as well as a horizontal indicator.

66. The at least one program storage device of claim 63, wherein said ascertaining further comprises mapping the maximum indicator to a level of an n-level quantizer if the value of the maximum indicator is between predefined thresholds, and mapping the maximum indicator to a constant number if the indicator is outside of said predefined thresholds.

67. The at least one program storage device of claim 63, further comprising employing said mapping to identify an address of a frequency pattern in a look-up table, said look-up table containing a plurality of frequency patterns, and wherein said determining comprises selecting one frequency pattern of said plurality of frequency patterns.

68. The at least one program storage device of claim 67, wherein when the maximum indicator has a large nominal value it is re-mapped into a frequency pattern comprising a lesser number of frequency coefficients than a number of coefficients of a frequency pattern corresponding to when the maximum indicator has a smaller nominal value.

69. The at least one program storage device of claim 68, wherein said plurality of frequency patterns are indexed such that a population of one frequency pattern is a subset of a population of a frequency pattern with a lower index number.

70. The at least one program storage device of claim 68, wherein said determining comprises comparing each frequency coefficient of a block with respect to said selected frequency pattern, and if the coefficient belongs to the frequency pattern, the coefficient is retained as part of said group of frequency domain pixel data.

71. The at least one program storage device of claim 55, wherein after a final frame count, if the actual frame bits is smaller than the difference of a predefined number and a guard band value, the difference is computed and a number of zero bytes according to this difference is added to the final picture count to ensure said pseudo-constant bits per frame compressed signal.

72. The at least one program storage device of claim 55, wherein said method is implemented within an MPEG encoder.

73. The at least one program storage device of claim 55, wherein said dynamically encoding further comprises encoding said frame of the new scene as a intra-coded frame.

74. At least one program storage device readable by a machine, tangibly embodying at least one program of instructions executable by the machine to perform a method of processing a sequence of video frames, said method comprising:

dynamically encoding said sequence of video frames, said dynamically encoding comprising:

encoding multiple blocks of a first frame of the sequence of video frames in intra-coded mode using a first orientation for said intra-coded blocks; and

encoding multiple blocks of a second frame of the sequence of video frames in intra-coded mode using a second orientation for said intra-coded blocks, wherein said first orientation and said second orientation are perpendicular.

75. The at least one program storage device of claim 74, wherein said first orientation comprises a first diagonal orientation, and said second orientation comprises a second diagonal orientation.

76. The at least one program storage device of claim 75, wherein said first frame and said second frame comprise adjacent frames in said sequence of video frames.

77. The at least one program storage device of claim 75, wherein said multiple intra-coded blocks of said first frame are scattered throughout said first frame, and wherein said multiple intra-coded blocks of said second frame are scattered throughout said second frame.

78. The at least one program storage device of claim 75, wherein said multiple intra-coded blocks of said first frame are equally spaced along a direction perpendicular to said first orientation of said multiple intra-coded blocks, and wherein said multiple intra-coded blocks of said second frame are equally spaced along a direction perpendicular to said second orientation of the multiple intra-coded blocks.

79. The at least one program storage device of claim 75, wherein said encoding said multiple blocks of said first frame in intra-coded mode using said first orientation comprises imposing different sub-sampling rates on said multiple intra-coded blocks along said first orientation, and wherein said encoding multiple blocks of said second frame in intra-coded mode using said second orientation comprises imposing different sub-sampling rates on said multiple intra-coded blocks along said second orientation.

80. The at least one program storage device of claim 75, wherein said sequence of video frames comprises a plurality of even numbered frames and a plurality of odd numbered frames, and wherein said first frame comprises one frame of said plurality of even numbered frames and said second frame comprises one frame of said plurality of odd numbered frames, and wherein intra-coded blocks of said plurality of even numbered frames move along said first orientation in a direction opposite from that of intra-coded blocks moving along said second orientation within said plurality of odd numbered frames.

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